Journal of Cosmology and Astroparticle Physics, 2014, vol.2014, N8

Wiggly whipped inflation

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Abstract

Motivated by BICEP2 results on the CMB polarization B-mode which imply primordial gravitational waves are produced when the Universe has the expansion rate of about H 1014 GeV, and by deviations from a smooth power-law behavior for multipoles ℓ <50 in the CMB temperature anisotropy power spectrum found in the WMAP and Planck experiments, we have expanded our class of large field inflationary models that fit both the BICEP2 and Planck CMB observations consistently. These best-fitted large field models are found to have a transition from a faster roll to the slow roll V(φ)=m2 φ2/2 inflation at a field value around 14.6 MPl and thus a potential energy of V(φ) ~ (1016 GeV)4. In general this transition with sharp features in the inflaton potential produces not only suppression of scalars relative to tensor modes at small k but also introduces wiggles in the primordial perturbation spectrum. These wiggles are shown to be useful to explain some localized features in the CMB angular power spectrum and can also have other observational consequences. Thus, primordial GW can be used now to make a tomography of inflation determining its fine structure. The resulting Wiggly Whipped Inflation scenario is described in details and the anticipated perturbation power spectra, CMB power spectra, non-Gaussianity and other observational consequences are calculated and compared to existing and forthcoming observations. © 2014 IOP Publishing Ltd and Sissa Medialab srl .

http://dx.doi.org/10.1088/1475-7516/2014/08/048

Keywords

inflation, physics of the early universe, power spectrum